

STEPHEN ALFRED FORBES

29 May 1844 - 13 March 1930

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Illinois Natural History Survey - Celebrating the 150th anniversary
of Forbes' birth

Forbes was born, 29 May 1844, to pioneer parents in a log cabin on Silver Creek, Stephenson County, northern Illinois. His father died when he was 10 and his brother Henry, 11 years older, returned to the farm to take care of his mother, his youngest sister, and Stephen. Stephen went to a local school until he was 14 and then was tutored at home by his brother. Henry had abandoned plans to attend college when he returned home to care for the family, but he managed to send Stephen to Beloit Academy for a brief period in 1860 to prepare him for college. Plans for college were shortstopped by a lack of money, but Forbes taught himself to read French, Spanish, and Italian.

When the Civil War came, both Henry and Stephen shared support for the north. Henry sold the farm, gave what money was left after the mortgage was paid, to his invalid mother, who went to live with her oldest daughter. Henry and Stephen borrowed money to purchase horses and joined Company B, 7th Illinois Cavalry, in September 1861. At 17 he entered the army as a private, became a sergeant within a year, was promoted to lieutenant at 19, and to captain at



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Soon after he turned 18 he was captured near Corinth, Mississippi. He destroyed the dispatch he was carrying and was threatened with hanging if he did not produce it. He was held captive for 4 months at Mobile, Macon, and Richmond but was then paroled and released. While in prison at Mobile he bought a bible, a Greek grammar, and other Greek books. He was discharged from the army in September 1865.

In commenting on those who survived the war, Forbes said "To us war was not hell, but at the worst a kind of purgatory, from whose flames we emerged with much of dross burned out of our characters, and with a fair chance still left to each of us to win his proper place in the life of the world."

He went to Rush Medical College in Chicago after the war but left because of doubts that he was suited to the surgical aspects of the medical profession (especially surgery without anesthesia)--and a lack of money. For 5 years ending in 1872 he raised strawberries near Carbondale, taught school at Makanda, Benton, and Mount Vernon, studied and practiced medicine under a preceptor, and briefly attended ISU. In 1872 he began a career in biology, which ended with his death in 1930 in Urbana. His son believed his father's interests in natural science came from an academic background in the family, his agricultural experience, 4 years out of doors in the Army, a naturally thoughtful habit, and a scientific interest that continued after the end of his medical studies.

A listing of his career titles includes Curator, Museum of the State Natural History Society (1872-77); Instructor in Zoology, Illinois State University (1875-78); Director, State Laboratory of Natural History (1877-1917); State Entomologist (1882-1907); Professor of Zoology and Entomology (1884-1909) and Dean of the College of Science (1888-1905), University of Illinois; Agent, U.S. Fish Commission, Biological Expedition to the Rocky Mountains (1891-92); Director, Aquarium at the World Columbian Expedition, Chicago (1893); establishment of the Illinois Biological Station (the Survey's present Stephen A. Forbes Biological Station) on the Illinois River at Havana (1894), which became the first field station in the world to make a continuing study of a river system; and finally, Chief, State Natural History Survey (1917-30). In these capacities he made major contributions to the scientific world, but he never lost sight of his responsibility to the welfare of Illinois citizens.

In addition to his scientific interests and responsibilities, Forbes was active in his church, was one of the organizers of the first golf club at the U of I, belonged to a hiking club, and late in life delighted in driving a car. He was arrested for speeding on his 80th birthday, an event which he related with some pleasure. As a scientist, Forbes was a wildlife biologist, ornithologist, aquatic ecologist, entomologist, ichthyologist, and ecologist. Had the term BIODIVERSITY been in vogue during his lifetime, we would also call him a biodiversologist. His first report, published in 1870, was followed by more than 400 titles during his career. He

did not have a bachelor's degree, but in 1884 Indiana University awarded him a PhD degree by "thesis and examination."

He ran the State Laboratory of Natural History, parent organization of the INHS, and the State Entomologist's Office as a unit. He interchanged personnel and equipment and made both available to the U of I in many ways. For example, many individuals at the U of I published in the State Laboratory *Bulletin*. In 1917 the research activities of the State Entomologist and the State Laboratory of Natural History were combined as the Natural History Survey.

Frank Smith, professor of Zoology at the University of Illinois (*The Audubon Bulletin*, 1926, No. 17, wrote that Forbes "did most important work in botany and in a number of branches of zoology, [but] he was far more than a specialist in any branch. He studied the birds and fishes and the insects and the life of the rivers and lakes, all as elements of a great complex, and he studied them broadly in their relations to their surroundings. Man himself was his starting ecological factor. In fact, it will be difficult if not impossible to point out a naturalist of his generation who was more original or broader or sounder."

As Scott (1958:180) related, Forbes had the courage of his convictions to follow through with economic and natural history studies on wildlife even when Robert Ridgway (1901), a close associate of Forbes reported the prevailing attitude: "There are two essentially different kinds of ornithology: *systematic* or *scientific*, and *popular*. . . . Popular ornithology is the more

entertaining, with its savor of the wildwood, green fields, the riverside, and seashore, bird songs, and the many fascinating things connected with out-of-door Nature. But systematic ornithology, being a component part of biology--the science of life--is the more instructive and therefore more important."

Without Forbes' work, which had major impacts on the development of wildlife research and on the practice of wildlife management, the start of wildlife research would have been delayed for many years. I choose for the remainder of my time today to emphasize Professor Forbes' contribution to wildlife research and management.

One of the first documented appropriations for wildlife research in Illinois was legislative action approved 29 May 1879 to become effective 1 July 1879 (Scott 1958:179). Forbes reported, "We were directed to investigate the large and intricate subject of the food of birds in the interests of agriculture and horticulture, \$200 per annum being voted for the expenses of this work."

More than a half dozen of Forbes' publications during the 1880s and 1890s were on wildlife, mostly on birds; however, as L.L. Howard noted in his biographical memoir, Forbes first paper on a zoological subject--*Amblystoma*--was published in 1875 and was followed the next year by a "List of Illinois Crustacea with Description of New Species." During the first two decades of the 1900s, nine more publications on wildlife by Forbes were to appear.

"The Lake as a Microcosm," delivered by Forbes in 1887 at the Peoria Scientific Association and later printed, is now an

acknowledged classic considered by many to be the first study to recognize animal associations, which is the basis of ecology. Forbes not only considered the environment in his studies of birds, insects, and fishes, but he acknowledged that man and his interests were essential factors in the environments of organisms; even his economic studies took on a degree of biological interpretation not found in other publications of the time.

In 1903, 16 years after Forbes read his "Lake as a Microcosm" to a Peoria audience, he published "On Some Interactions of Organisms," a lesser known paper but one that deserves at least as much recognition. Because this second paper deals with terrestrial species, its tenets are more relevant to wildlife research. In it Forbes introduced the idea that modifications within any group of organisms--modifications in numbers, behavior, or distribution--inevitably affect other groups of organisms and that these changes in turn cause still other forms of change. Oddly enough, this assertion seems to contradict one of the central conclusions of the paper--that predators of plants and animals, "their enemies" as Forbes put it, have little effect on the numbers of those plants and animals.

In a footnote to this paper he observes that if the prevailing view of the value of parasitic and predaceous insects were accepted, the bluebird would be condemned to extermination as a pest. On the other hand, if the argument of his paper is valid, the bluebird is useful and should be preserved. In a sense, this footnote embodies Forbes' ideas regarding the interrelations among

animals, but it also suggests that he valued a given species on the basis of whether it was beneficial--to man, of course. Based on that criterion, a species should be eliminated if it were found to be a pest. No doubt that view was acceptable to turn-of-the-century Americans with their expansionist world view and post-frontier psychology. Today most scientists would not consider the extermination of so-called pest species a viable option.

Forbes' early interest in the diets of birds clearly sprang from an economic motive. Initially, he was looking for a better way to determine the value of birds to agriculture; only later did his work extend to numerical studies. He made clear the importance he placed on the study of food habits in the formulation of biological principles and in the assessment of the economic value of birds. He believed that it is through food relationships that animals come into contact with each other and their environments most often and where competition is sharpest and most deadly. It is through the food relations especially that animals compete most strongly with the interests of man. Thus, in one statement he justified the study of the food habits of birds for scientists, legislators, and farmers. As we look at some of Forbes' views from today's perspective, we sense that they were often developed with one eye on the large domed building about a hundred miles west of here and the funding its inhabitants can provide.

Forbes noted, again in the interactions paper of 1903, that the interests of plants and animals and the interests of their enemies--diseases, parasites, and predators--are the same and that

natural selection has constantly adjusted this common interest. Whatever injures a plant also injures the insect that feeds on it. Insects, therefore, must not significantly harm the plants on which they depend for food but must take only excess foliage or fruit and prevent the plant species from overcrowding. When an insect becomes too abundant, a reduced food supply reduces the numbers of that insect and the plant species recovers and so on, in Forbes' words, **"through an oscillation of indefinite continuance."** In short, the concept of the balance of nature. Thus, it is only an unlucky accident when a predator species significantly injures a prey species, and it is highly unlikely that a destructive species can be exterminated, or even have its numbers permanently depressed by a parasite that is dependent on it. This assumption lessens considerably the economic role of parasites. He also argued that destruction of all the enemies of a species probably would not result in an increase in the average numbers of that species. Instead, he envisioned a general law that applied to all organisms: the real limits to the number of a species were set by the inorganic environment. The idea that "enemies" have little effect on average numbers was probably more accepted 45 years ago than it is today.

Forbes did, however, point out that plants and insects had existed for vast amounts of time with neither birds nor mammals on earth to, in his words, **"supervise or regulate their relations."** If every living vertebrate were suddenly wiped out, he concluded, great changes would result but without a doubt nature would make

adjustments and go on much as before. Any subkingdom of animals could be exterminated without a chance that terrestrial life would perish. Some functions of the missing member would be eliminated by new adjustments, and other functions would be taken on by other members.

As a result of the foregoing speculations, Forbes concluded that in general plants and animals with the most stable numbers were those that lived in the most varied habitats and had the largest number of predator species. Further, the best protection was afforded to animal species that took a variety of foods so that their numbers were less seriously affected by a decrease in any one food species.

In developing what he called "economic biology," Forbes believed that the most significant endeavor was the discovery of the laws of oscillation in plants and animals and the deciphering of nature's way of preventing and controlling those oscillations. The first requirement for such discovery, he believed, was "a thorough knowledge of the natural order--an intelligently conducted natural history survey. Without such knowledge, all measures were empirical, temporary, uncertain and often dangerous." What member of the Natural History Survey can disagree today?

His interest in economic biology is evident throughout his work. In the interactions paper of 1903, he noted that we must first discover how far nature will go to supply our needs and accomplish our purposes. Then we must move to determine where we can improve upon nature and where we must set it aside completely.

He believed that most often we find nature's system inadequate for our purposes and that all of man's cultures attempt to set nature aside more or less completely and substitute his artificial arrangements, devised solely for our own interests.

In spite of this optimistic turn-of-the-century view, Forbes warned that in a comparison of nature's order and the interests of man, there is almost always considerable conflict. The natural order provides for the mere maintenance of the species, whereas man's requirements are much greater. Man urges excessive and superfluous growth and increase of plants and animals, and that all the surplus goes to supply human wants. Numerous disturbances arise from these human interferences with nature's system. Many of the disturbances are dangerous, others Forbes believed were full **"of positive evil."** The oscillations of species which appear are as injurious to man as they are to the plants and animals more directly involved. For example, most of the serious insect problems result from species whose injurious oscillations come from changes brought about by man. Finally, Forbes concluded, **"The main lesson of conduct taught us by these facts and reasonings is that of conservative action and exhaustive inquiry. Reasoning unwarranted by facts, and facts not correctly and sufficiently reasoned out, are equally worthless and dangerous for practical use."** What better advice can we receive today?

In a 1912 paper, "The Native Animal Resources of the State," he observed that the loss of wildlife in Illinois as a result of settlement was natural and inevitable--**"so much so as the flow of**

time and the wake of the revolving moon." Once the native animals of the State had been its most important asset, furnishing most of the food, all of the clothing, and almost all of the exportable products. By 1912, however, wildlife had been reduced to economic insignificance. On economic grounds alone there would be few objections to the extermination of all native fauna if the "bad" went with the "good." In a telling image he indicts the attitudes of his contemporaries by saying that they would gladly give up the state's remaining native fish and game if they could also include what we commonly call our insect enemies, and the gophers, mice, moles, hawks, and owls. The major thrust of the paper is to convince the reader that this transformation must somehow profitably be arrested or reversed, and we might well underscore the word profitable. It is to the State that he turns, "Most men still act towards the wild life of the State precisely as if they were wild animals themselves, and seem to think no more of its future than does the hawk or the hungry wolf but the State, as such, has recognized of late, its responsibility to future generations, and is beginning to shape the course of events with forethought and intelligence in the permanent interests of its people." Perhaps Forbes gives the State a bit too much credit.

In this paper his discussion of the waters of the State focus on the Illinois River. He notes that recent censuses make it plain that the clam fisheries of the State are being rapidly exhausted and that the European carp is rapidly swamping and smothering out several native food fishes. He cautions against the sewage

overload in the Illinois from the recent opening of the Chicago Drainage Canal, warns that drainage ditch operations are already a menace to the river's productivity, which is dependent upon the extent and condition of its backwaters and the period of its overflow, and predicts that straightening and channeling the Illinois to make it a "**great artery of commerce**" will have further negative effects. He notes the economic and aesthetic reasons for protecting birds and urges the passage of national laws forbidding the destruction of migrant species. Without restrictive laws on hunters, he argues that the resident game birds of the state would have disappeared long ago.

In the midsummer bird papers of 1913 and 1922 Forbes published counts of birds by species and habitat. The very notion of compiling such data was innovative but he included little analysis or interpretation. Again we find Forbes concerned with building a data base on which future policy could be built.

As we have briefly seen, Forbes' views were a mixture of innovative thinking and traditional doctrine. In the 1912 paper, for example, he reported that prairie-chickens, thanks to protective laws, were present in 74 Illinois counties. At the same time, he recognized that something besides protection affected their numbers because the open prairie, where the prairie chicken was formerly most numerous, was now the least favorable habitat because of intensive agriculture.

In a 1958 report, Thomas Scott, then head of the Wildlife Section of the INHS, credits Forbes with the initiation of wildlife

research at the INHS. He cites Forbes professional qualifications but notes as well "his intense desire to contribute knowledge relating to human economy and welfare." Without question, the theme of benefits to society is found throughout Forbes writing.

Most of Forbes' biological insights--his insistence on long-term data bases, his understanding of the dynamics of animal populations, and his views on the role of predation--have long since been incorporated into theory and practice. It may well be that for the current and next generations the major contribution of Professor Forbes will be not his ecological insights or his emphasis on regulations for hunters but his conviction that the use of natural resources must benefit all of society. Of course, the future use of wildlife for the benefit of society will differ substantially from Forbes' views and, I might add, from the views of most wildlife biologists of the past half century.

For this discussion, I have relied on the published and unpublished reports in the INHS Library and in other divisions of the U of I Library. If you wish to know more about this remarkable man, I urge you to read some of these materials.

REFERENCES ON FORBES' LIFE

n.d. Unpublished bibliography of S.A. Forbes.

Dexter, Ralph W. 1968. Contributions of Stephen A. Forbes (1844-1930) to the development of nature study. Nature Study (Spring 1968):4-5.

Havera, Stephen P. and Katie E. Roat 1989a. Forbes Biological Station: The past and the promise. Illinois Natural History Survey Special Publication 10. 24pp.

----- and ----- 1989b. Stephen A. Forbes Biological Station. Illinois Natural History Survey Reports No. 286.

Howard, L.O. 1932. Biographical Memoir of Stephen Alfred Forbes. National Academy of Sciences 15:1-54.

Mills, Harlow B. 1958. From 1858 to 1958. Illinois Natural History Survey Bulletin 27(2):85-103.

Sanderson, Glen C. 1989. Wildlife Management. Unpublished report presented at the Plenary Session, 51st Midwest Fish & Wildlife Conference, 4 December 1989, Springfield, Illinois. 10pp. (A discussion of Forbes' contribution to wildlife management).

Scott, Thomas G. 1958. Wildlife Research. Illinois Natural History Survey Bulletin 27(2):179-2301.

Scott, Thomas G. 1961. Stephen Alfred Forbes. Audubon Bulletin 119:1-5

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